ITF Transport Outlook 2019

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International Transport Forum

OECD

Outlook: Strategic tool

- ITF's "flagship" publication – part of OECD Outlook series
- In-house models covering all modes of transport, freight and passenger – globally, nationally, cities
- Long-term development of global transport volumes and related CO_2 emissions, health impacts, SDGs
- Allows us to analyse how world could change if we choose different policies and development paths

Projecting under uncertainty

- How socio-economic changes affect transport demand
  - Population, GDP, trade, transport policies
- Relies on our understanding of how these affected transport in the past
- Uncertainty is an inherent element of future transport scenarios
  - Slowing economic growth, changing demographics, travel behaviour, technology and innovation

Underlying drivers

Socio-economic	Supply measures	Demand measures	Vehicle / Fuel Efficiency
• GDP • Population • Urbanisation rate • Urban sprawl • Car ownership	• Road supply • Transit supply (bus) • Mass transit (BRT, Metro)	• Fuel price • Parking price • Transit ticket price	• Vehicle occupancy rates • Fuel economy • Fuel mix

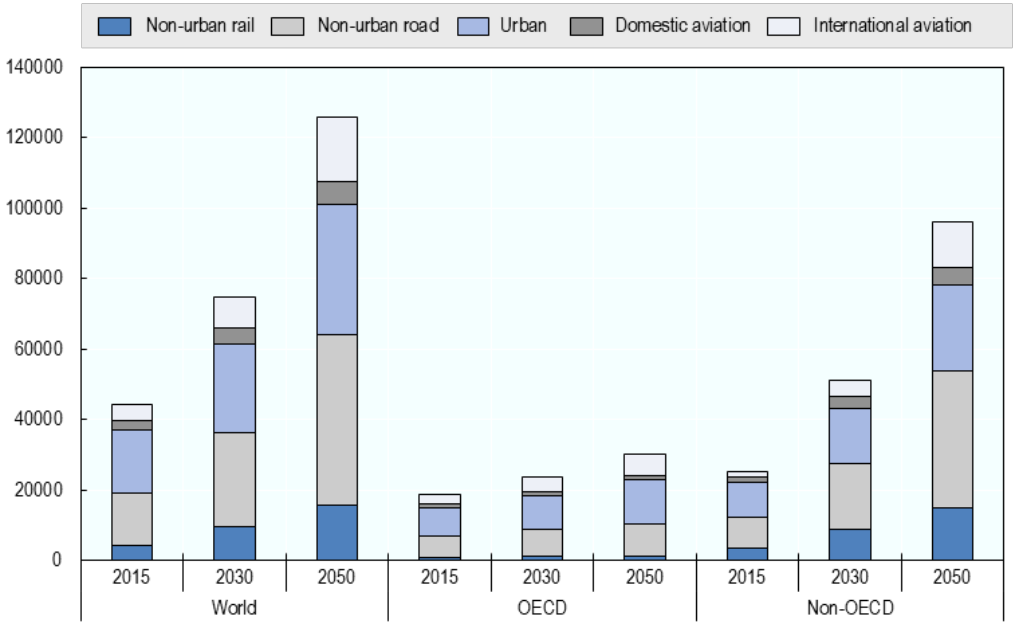
Passenger transport demand to triple by 2050

China and India to generate 1/3 of global pkm

OECD share of pkm falls from 43% to 24%

Non-urban road is the largest mode by 2050

Current demand pathway, billion passenger-kilometres



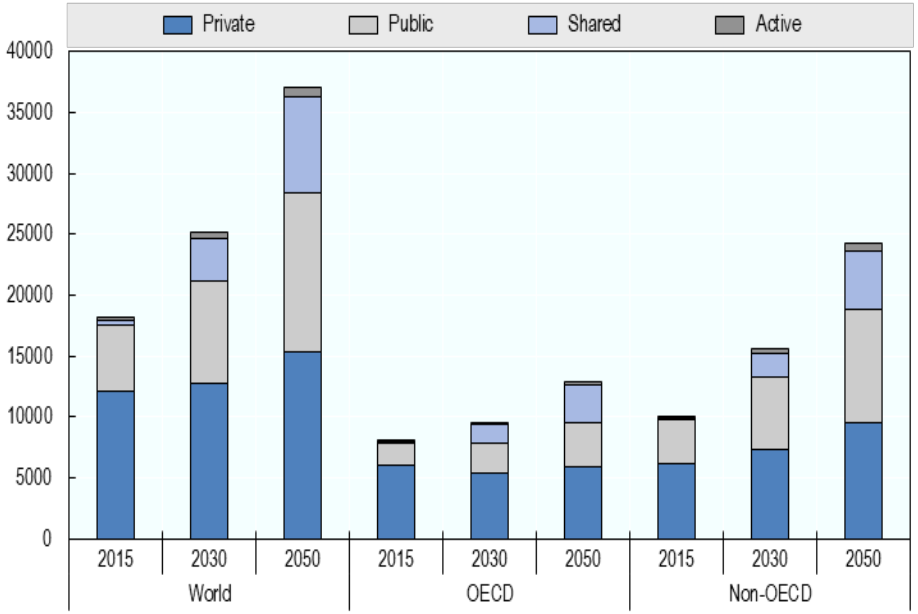
Urban passenger transport to double by 2050

Shared mobility* is the fastest growing mode

Public transport ridership growth strong in non-OECD rail and metro

Car use still dominant but declining

Current demand pathway, billion passenger-kilometres



*Free-floating shared vehicle systems (cars, bikes, scooter, motorbikes) and shared taxis and minibuses

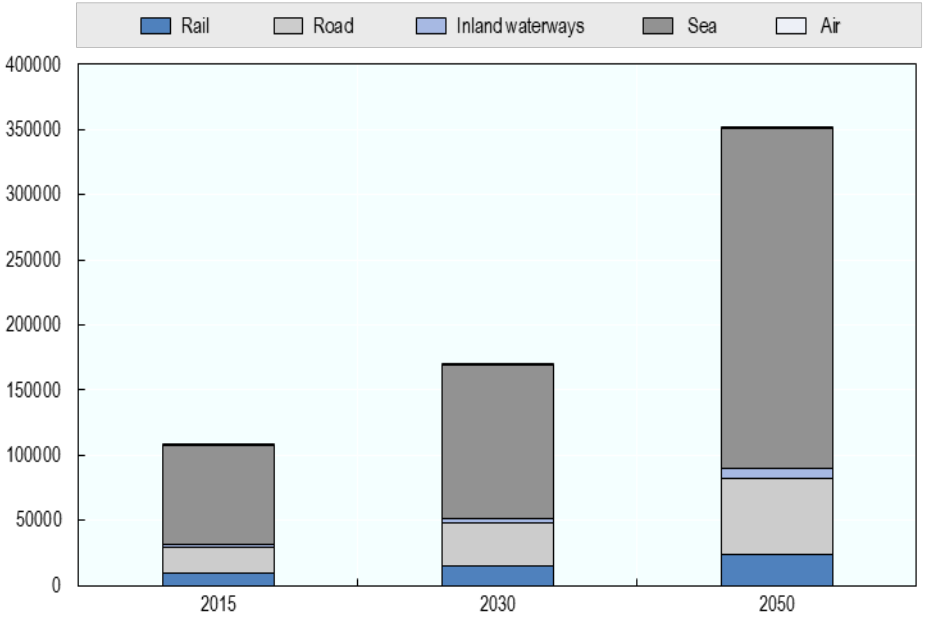
Freight growth subject to significant uncertainties

Tkm to triple by 2050

Maritime continues to dominate freight (no major modal shifts)

Anticipating bottlenecks and planning investment difficult

Current demand pathway, billion tonne-kilometres



Policy scenarios: current and high ambition

- Car access restrictions
- Pricing
- Mass transit
- Transport integration
- Urban density
- Carbon pricing
- Trade of coal and oil
- Logistics efficiency
- Efficiency and EVs

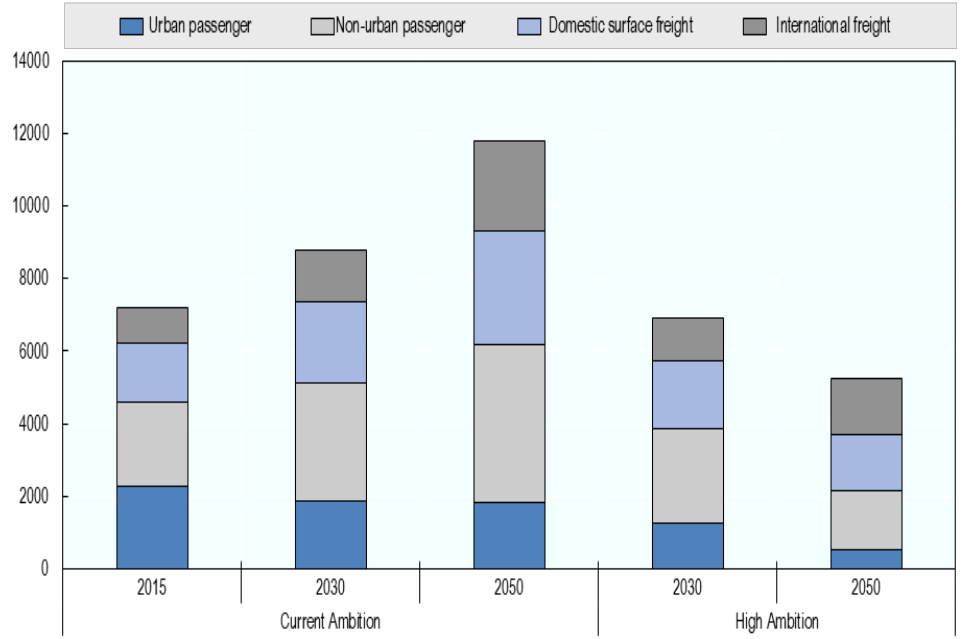
Current ambitions not enough to achieve climate goals

Transport-related CO_2 emissions to grow over 60% by 2050

More ambitious policies could reduce emissions by 30%

Importance of disruptive innovations

Transport CO_2 emissions, million tonnes



2019 Edition: Focus on disruptions

- Teleworking
- Shared mobility
- Autonomous driving
- Long-haul LCC
- Energy innovation
- Ultra-HSR
- E-commerce
- 3D printing
- New trade routes
- Energy innovation
- High-capacity vehicles

Disruptions for urban passenger transport

Teleworking	3-30 % of trips affected
Shared mobility	Current uptake speed or x2
Autonomous driving	3%-40% of trips affected
MaaS	20%-50% of trips are “integrated”
Access restrictions	20%-60% of trips affected
Parking pricing	10%-40% price increase

Teleworking

- Teleworking is increasing
  - Internet and mobile technology, social acceptability by employers and employees
- Significant differences between countries
  - 2% (Middle East) up to 30% Denmark, Finland, Netherlands
- Can reduce traffic volume - but depends on context
  - Rebound effect, work location, increased leisure travel etc.
- Overall simulation still positive > -2% pkm and CO_2

Massive shared mobility

- Sharing economy the most remarkable disruption in recent years
  - Wide-ranging shared mobility services already available
- Future uptake and impact highly dependent on regulatory frameworks and relationship with public transport
- Shared mobility with loose regulation: uptake of shared systems by single users, often replacing public transport – negative impact
- Shared mobility with integrated MaaS solutions, access restrictions for private cards, pricing: vehicle-kilometres -50%

Autonomous driving

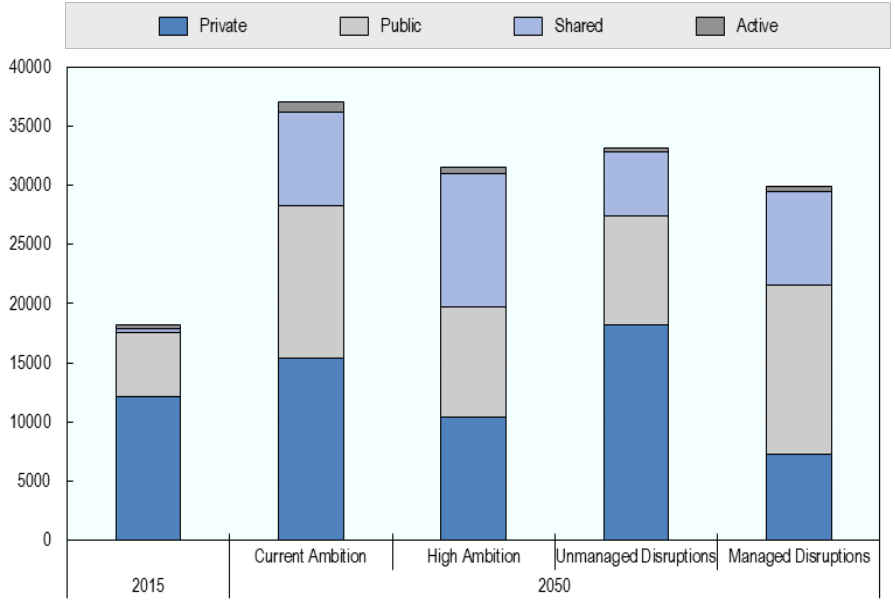
- Already existing trend and we assume to increase
  - Baseline 0%-2.5%, disruption 25%-40%
- Drivers for acceptancy: safety performance, perception and expectation for driving performance, improved accessibility, cost
- Impacts on vehicle-kilometres, congestion, space allocation and substitution effect with public transport and active mobility
- Without any regulation can lead to increased VKM
- With regulation reduced congestion and CO_2 emissions due to higher occupancy rates

Importance of managing change

Unmanaged disruption leads to modal shift towards private car use in urban areas

Managed disruption (policy actions and regulation to support transition) can result in significantly more sustainable urban mobility

Urban mobility, million passenger-kilometres



Disruptions for inter-urban passenger transport

Long-haul LCC	3-30 % of trips affected
Energy innovation	Cost decrease and range of electric planes
Autonomous vehicles	5%-25% of trips affected
Shared transport	13%-27% trips affected
Ultra-HSR	Technology assumptions
Cost of carbon	USD 500 – USD 1000 per tonne

Long-haul LCC

- Several attempts to transfer point-to-point LC model to long-haul market but so far failed
  - Lack of O-D demand, higher fuel costs, utilisation rates, in-flight comfort, staff costs
- Few have succeeded (Air Asia X, Norwegian Long Haul)
  - Three factors: liberalisation of aviation market, technological evolution of aircraft, increased demand from new user groups
- Potential share around 16% by 2050 > particularly Middle East and transition countries and Europe-Asia.

Ultra-HSR

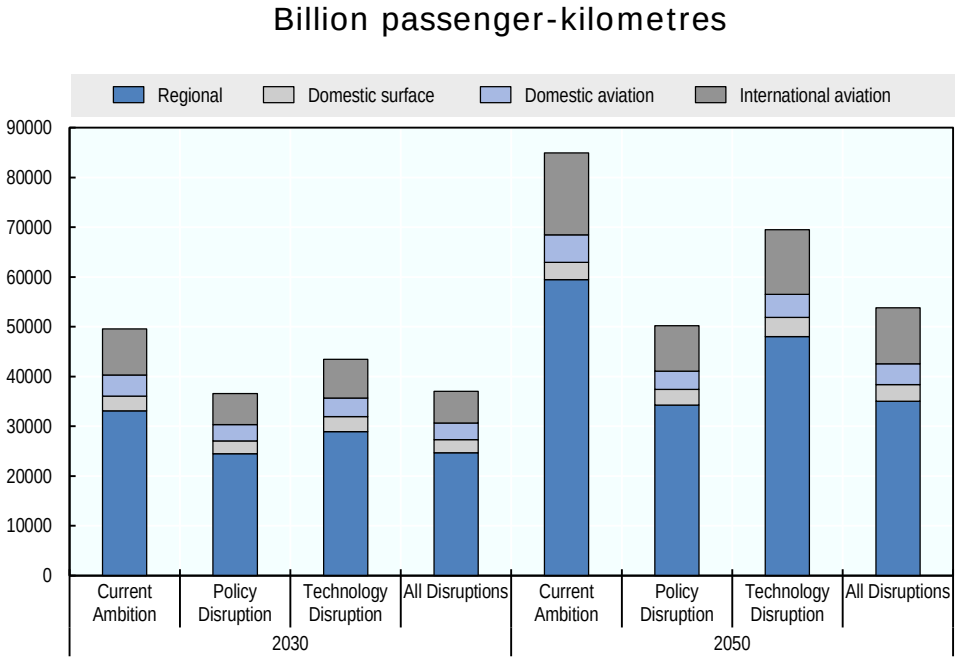
- Over 43,000 km of rail above 250 km/h in 2018 (75% in China)
  - Additional 10,000 km construction underway and 40,000 km under discussions world wide
- Ultra-high speed rail: Maglev and Hyperloop (electro-magnetic suspension with maximum speed 500 – 1200 km/h
  - Depends on construction costs, fare levels, and demand
- Untapped HSR potential around 75,000 km of tracks – but limited CO_2 reduction potential - 1% of total domestic non-urban transport
- UHS more limited – 10,000 km of tracks and small impact on CO_2

No major mode shift expected for non-urban travel

Not very sensitive to technology or policy changes

Reduced cost of transport may lead to longer trips

Combined technology and policy disruptions needed to reduce CO_2



Disruptions for freight transport

E-commerce	5%-25% increase
3D printing	Up to 38% reduction in trade value
New trade routes	Central Asia, Arctic route
Energy innovation	20%-80% reduction in carbon intensity
Autonomous trucks	Up to 90% uptake for inter-urban
High-capacity vehicles	5%-20% uptake

E-commerce

- Already existing trend and we assume to increase
  - Baseline 5%, disruption 25% additional demand
- Most likely disruption - disruptive impact especially for urban operations and deliveries
  - Increase from consolidated to peer-to-peer logistics
- Leads to increase demand and emissions, particularly urban and air > policy response: low emissions zones, low emission vehicles, collection points

3D-printing

- Potentially the largest impact on logistics (Up to 38% reduction in trade value)
  - Drastically reduces trade, increases re-shoring
- No strong consensus on the likelihood of mass adoption
  - Depends on cost compared to traditional manufacturing
  - Business proximity to customers (centralised printing)
- May lead to a significant change for load factors (more uniform materials)

New trade routes

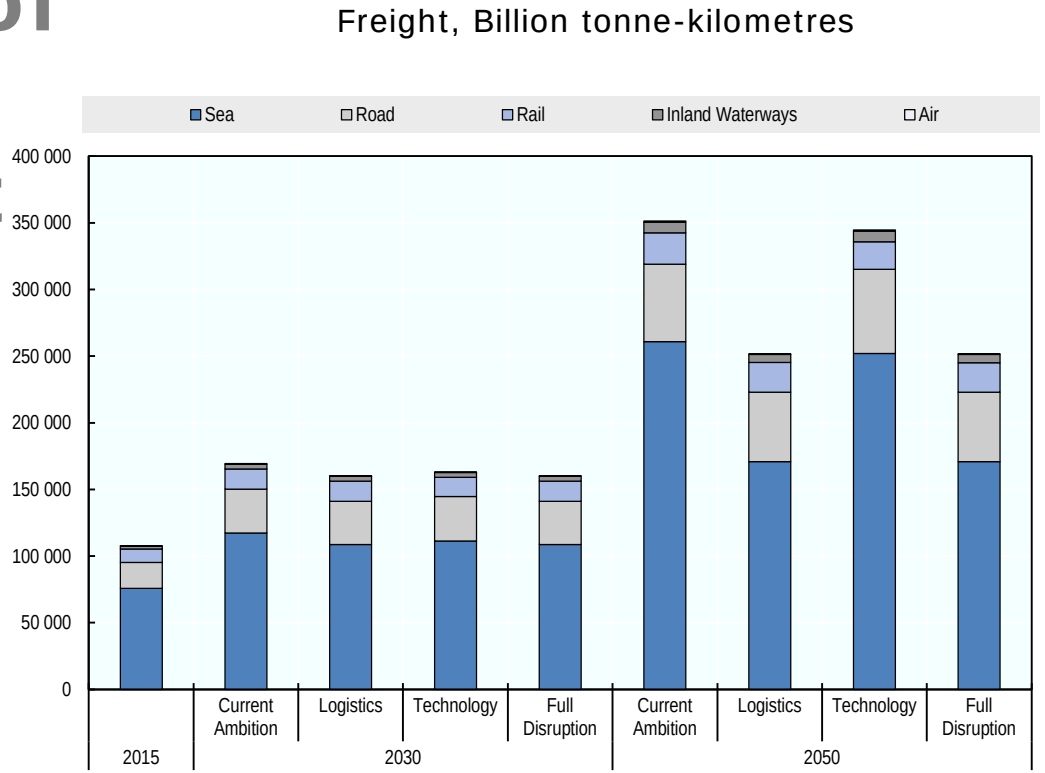
- Major potential impact in terms of shifting routes
  - Artic shipping would shift trade from Suez Canal
  - Improved Eurasia land connectivity also shifts trade for some commodities towards rail corridors
- In the short- or medium-term likelihood of Arctic shipping small
- Shifting routes affect future infrastructure needs
  - Overcapacity in some existing links
  - New bottlenecks in new routes

Potential impact of disruptions the largest for freight

Massive changes in costs, activities and supply chains

Changes trade patterns, infrastructure use, logistics chains

Poses a challenge for investment decisions



Disruptions: messages for policymakers

- Transport policy must anticipate disruptions that originate outside the sector
- Better planning tools needed to improve adaptability to uncertainties
- Transport systems will benefit from policy frameworks that foster innovation
  - From static regulation to frequent regulatory reviews

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High capacity vehicles

- Trucks above 60 tonnes – can already be applied
  - E.g. Finland today 76 tonnes and 34,5 meters
- More efficient operations lead to lower unit costs and emissions
  - Scenario assumes 20% of inter-urban freight with HCV
  - Truck loads increase 50%, costs decline 20%
- Some modal shift towards road (but less than autonomous vehicles)
- In aggregate leads to a slight global decrease in emissions

Energy transition for trucks

- Driven by need to reduce CO_2 emissions and diversify energy sources for more resilient system (dependency on oil)
- E-highways, hydrogen, battery technology, synthetic renewables, biofuels
  - Scenario: 37% heavy truck-km with alternative fuels by 2050
- After 3D printing had the largest impact on emissions
- Much more likely to happen
- Directly dependent on policy decisions

Autonomous trucks

- Significant cost reduction potential - incentive for industry through reduction in labor cost, driver restrictions
  - Scenario: Up to 90% uptake by 2050 on inter-urban routes in some regions
- Several barriers still exist: technology, business models, insurances
- Short-term: increased used of assisted-driving technology
- Can lead to important modal shifts to road

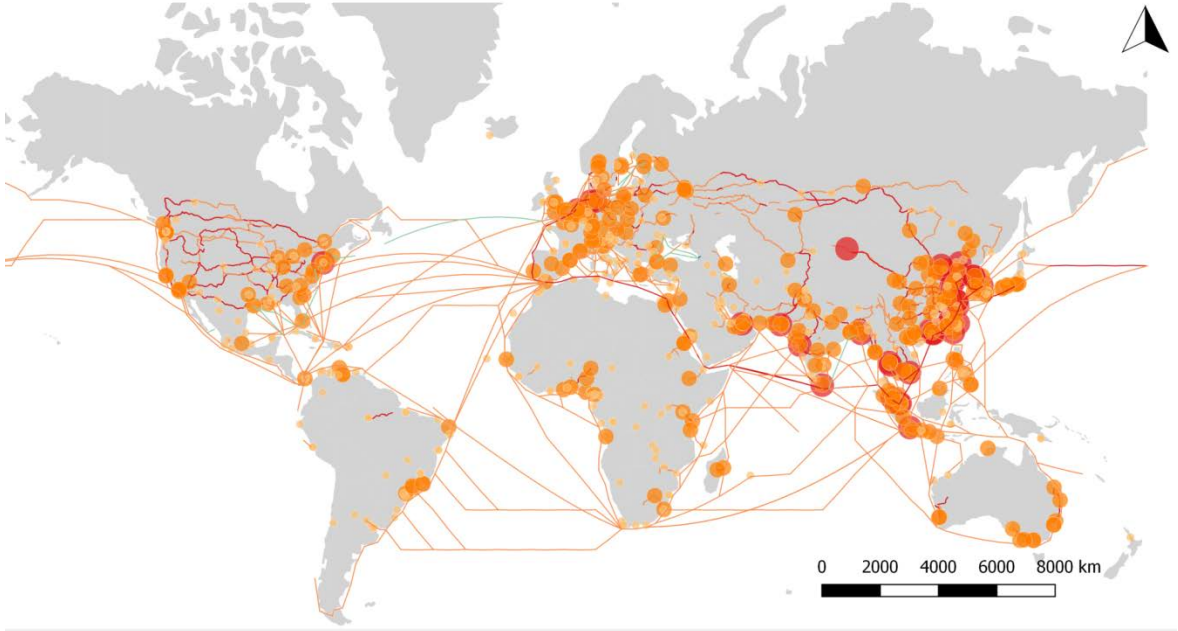
Alternative aviation fuels

- Some potential for electrification for short-haul flights (Flights up to 1000 km which cover 15% of RPK and half of departures)
  - Reduce 40% of take-off and landing emissions and 15% jet fuel use
- Synthetic fuels
  - Significant energy required to produce
  - Also depends highly on the cost of conventional fuel
- Need to consider also well-to-tank emissions

Disruptions for freight transport

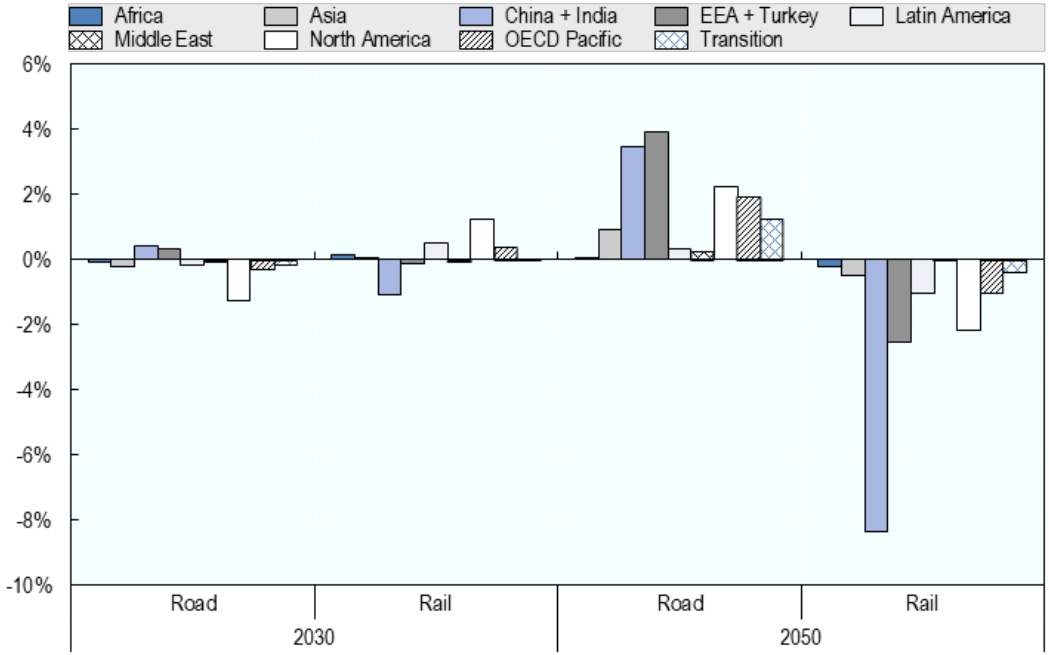
Schematic overview of likelihood and potential impacts

3D-printing


0 2000 4000 6000 8000 km
Legend
Variation of surface surface and maritime freight (% tkm change)
More than 50 decrease
20 - 50 increase
50 - 20 decrease
More than 50 increase
Variation of ports and airports loaded and unloaded cargo (% tonnes change)
More than 50 decrease
20 - 10 decrease
20 - 50 increase
50 - 20 decrease
10 - 20 increase
More than 50 increase

Energy transition for trucks

Percentage change in tonne-kilometres compared to current ambition scenario



High capacity vehicles

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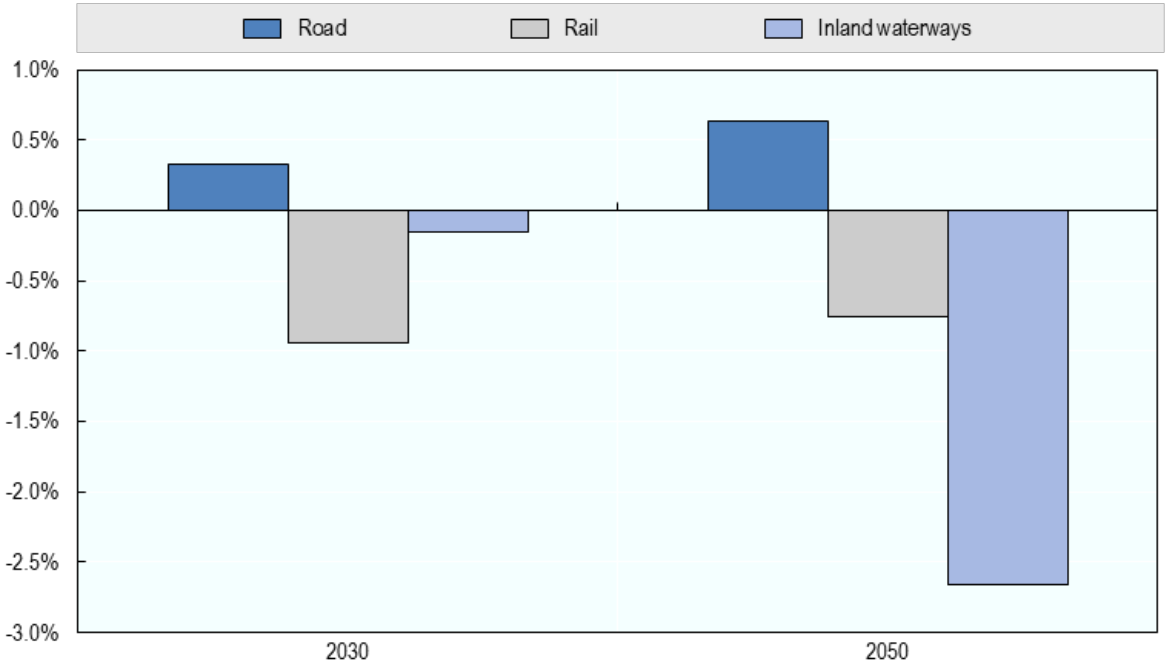
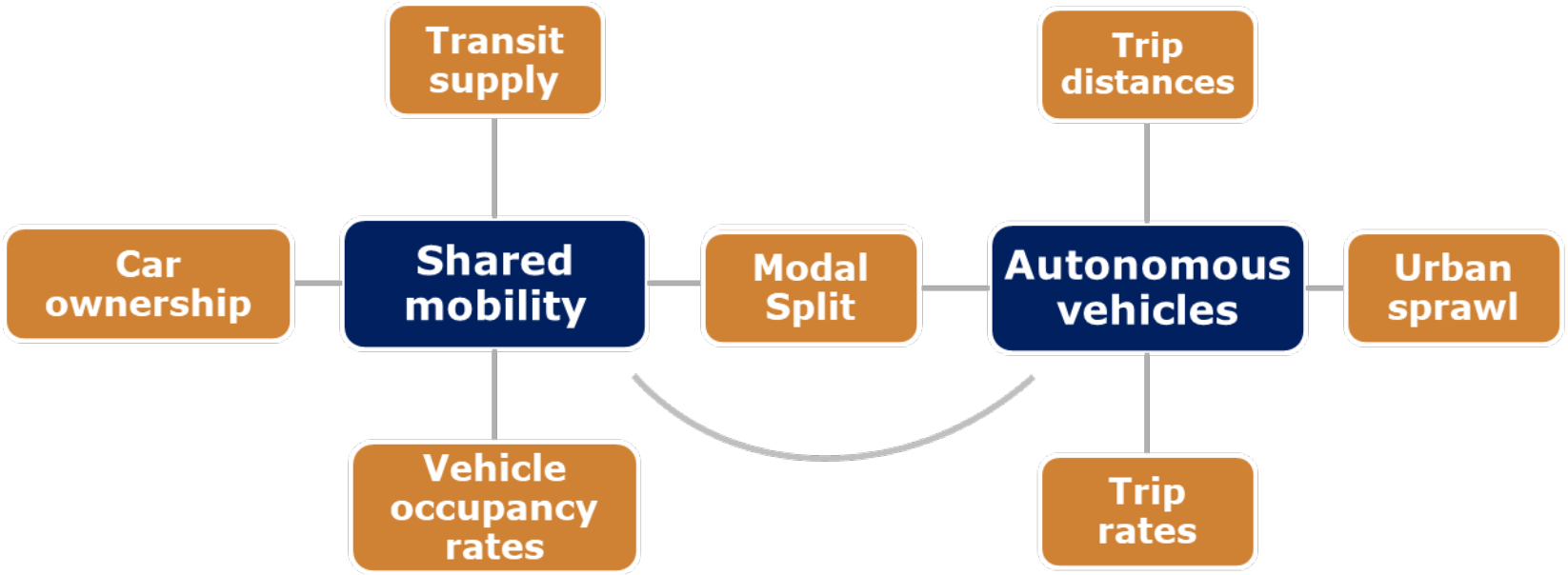


Disruptions: potential impacts on urban mobility



Policies will lead to shifts by sector

Share of urban transport declines in all scenarios

Global freight increases share in CO_2 emissions
36% → 48%

Reflects current policy focus on urban transport

Transport CO_2 emissions, million tonnes